CLAIMS

Sub B1 1. A radiation detector comprising:

a thermopile; and

a can enclosing the thermopile in a low conductivity environment, the can having a unitary structure of high thermal conductivity material, the can structure comprising an elongated radiation guide of a first internal diameter extending from a viewing window to a rear volume of larger internal diameter in which the thermopile is mounted, the can structure having an outer surface with an outer diameter at its end adjacent to the window which is less than an outer diameter about the rear volume, the outer surface being tapered about the radiation guide such that a unitary thermal mass of increasing outer diameter is provided about the end of the radiation guide adjacent to the rear volume.

2. A radiation detector as claimed in Claim 1 further comprising an additional thermal mass surrounding the rear volume and a portion of the unitary thermal mass and in close thermal contact with the can structure.

3. A radiation detector as claimed in Claim 1 wherein the can provides a narrow field of view from the thermopile of about sixty degrees or less.

4. A radiation detector as claimed in Claim 1 wherein the window is a lens.

5. A radiation detector as claimed in Claim 1 wherein the length of the radiation guide and the field of view through the radiation guide from the thermopile are such that the thermopile only views an ear canal within about 1.5 centimeters of a tympanic membrane.

6. A tympanic temperature sensor comprising:

a thermopile; and

a can enclosing the thermopile in a low conductivity environment, the can comprising an elongated radiation guide ~~extended~~ded from a viewing window to a rear volume in which the thermopile is mounted, the radiation guide providing a field of view from the thermopile of about sixty degrees or less.

7. A tympanic temperature sensor as claimed in Claim 6 wherein the window is a lens.

8. A tympanic temperature sensor as claimed in Claim 6 wherein the length of the radiation guide and the field of view through the radiation guide from the thermopile are such that the thermopile only views an ear canal within about 1.5 centimeters of a tympanic membrane.

9. A tympanic temperature sensor as claimed in Claim 6 wherein the length of the radiation guide and the field of view through the radiation guide from the thermopile are such that the thermopile only views an ear canal within about 1.0 centimeter of a tympanic membrane.

10. A tympanic temperature sensor as claimed in Claim 6 wherein the outer thermal RC time constant for thermal conduction through a thermal barrier to the can is at least two orders of magnitude greater than the inner thermal RC time constant for the temperature response of a cold thermopile junction to heat transferred to the can through the thermal barrier.

11. A radiation detector comprising:

a thermopile having a hot junction and a cold junction, the hot junction being mounted to view a target;

a temperature sensor for sensing the temperature of the cold junction;

an electronic circuit coupled to the thermopile and temperature sensor and responsive to the voltage across the thermopile and a temperature sensed by the temperature sensor to determine the temperature of the target, the electronic circuit determining the temperature

of the target as a function of the temperature of the hot junction of the thermopile determined from the cold junction temperature and a thermopile coefficient; and

a display for displaying an indication of the temperature of the target determined by the electronic circuit.

12. A radiation detector as claimed in Claim 11 wherein the electronic circuit determines target temperature from the relationship $T_T^4 = (KhH) + T_H^4$ where T_T is the target temperature, Kh is a gain factor, H is a sensed voltage from the thermopile and T_H is the hot junction temperature of the thermopile.

13. A radiation detector as claimed in Claim 12 wherein the electronic circuit determines the hot junction temperature T_H from the sensed voltage and cold junction temperature and a thermopile coefficient which is specified at a predetermined temperature, the thermopile coefficient being temperature compensated by the electronic circuit as a function of a temperature between the hot and cold junctions.

14. A radiation detector as claimed in Claim 13 wherein the electronic circuit determines the gain factor Kh as a function of the difference between a calibration temperature and a temperature between the hot and cold junction temperatures.

15. A radiation detector as claimed in Claim 12 wherein the electronic circuit determines the gain factor Kh as a function of the difference between a calibration temperature and a temperature between the hot and cold junction temperatures.

16. A radiation detector as claimed in Claim 11 wherein the electronic circuit determines the target temperature from the relationship $T_T^4 = (KhH) + T$ where T_T is the target temperature, H is a sensed voltage from the thermopile, T is a temperature of the thermopile and Kh is a gain factor which is a function of the difference between a calibration temperature and a temperature between the hot and cold junction temperatures.

17. A radiation detector comprising:

a thermopile mounted to view a target of biological surface tissue;

a temperature sensor for sensing ambient temperature;

an electronic circuit coupled to the thermopile and temperature sensor and responsive to the voltage across the thermopile and the temperature sensed by the sensor to provide an indication of an internal temperature within the biological tissue adjusted for the ambient temperature to which the surface tissue is exposed; and

a display for providing an indication of the internal temperature.

18. A radiation detector as claimed in Claim 17 wherein the biological surface tissue is tympanic membrane and the display provides an indication of core temperature.

add B7